WSRC 45-1Q (Rev 4-16-2002)

# Procurement Specification Cover Sheet

1. Title

TECHNICAL SPECIFICATION FOR MELTER ASSEBMLY CABLE AND CONNECTORS (U)

Project #LW-5901

| 2. Specification No. | 3. Revision | 4. Page |
|---|---|---|
| E-501 | 6 | 1 of 7 |

| 5. Functional Classification | 6. Requester Department | 7. Requester Division |
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| PS | DWPF DESIGN ENG. | PD & CS |

8. Cognizant Technical Function

Name: Zahid Dasti — Date: 2/14/07

Title: Mechanical Engineer

Department: PD & CS

9. Additional Reviewer

Name: R. M. Williams — Date: 2/20/07

Title: Sr. Design Engineer

Department: PD & CS

10. Cognizant Quality Function

Name: Bruce Dragon — Date: 2/22/07

Title: Quality Engineer

Department: Waste Solidification / Quality Engineering

11. Manager

Name: Achyut Patel — Date: 2/22/07

Title: Project Engineer

Department: DWPF Design Engineering

12. Other Approver Reviewer 2-21-07

Name: Allan Weikel — Date: 2-21-07

Title: Lead - Core Specification Group

Department: PESG

# Standard Procurement Specification Revision History Sheet

| 1. Specification No. | | | 2. Revision No. | 3. Page |
|---|---|---|---|---|
| E-501 | | | 6 | 2 of 7 |
| 4. Date | 5. Revision No. | 6. Paragraph No. | 7. Description of Changes | |
| 8/30/1988 | 0 | General | Final Construction release | |
| 1/21/1991 | 1 | General | Final Construction release | |
| 3/25/1991 | 2 | General | Final Construction release | |
| 6/6/1991 | 3 | General | Final Construction release | |
| 5/20/1992 | 4 | General | Final Construction release | |
| 3/11/2004 | 5 | General | Issued for Melter 4 Procurement | |
| 2/22/2007 | 6 | Table of Content | Revised page numbering & heading of section 1.0 | |
| | | 1.0 | Added/defined 'Washington Savannah River Company' | |
| | | 6.1 | Revised National Electrical Code to current active "year of Issue" | |
| | | 8.2 | Corrected the paragraph; removed duplicate words "and provide" | |
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## 1.0 PURPOSE

The purpose of this specification is to define the basic technical requirements for the power, control, instrumentation and thermocouple extension cable and cable connectors for the Melter Vessel Assembly. For general melter requirements, see Specification M-500, 'Technical Specification for Melter Vessel Assembly for the Defense Waste Processing Facility'. This section, augmented by the appropriate Washington Savannah River Company (WSRC) supplied detail and connection drawings, defines the requirements for the installation of low voltage cable and furnishing and installation of connectors on the melter vessel assembly.

## 2.0 SCOPE

### 2.1 Scope covered by this section

2.1.1 Installation, termination, inspection and testing of low voltage power, control, instrumentation and thermocouple extension cable. WSRC to furnish all cable to supplier.

2.1.2 Furnishing, installation, and inspection of cable connectors

2.1.3 Furnishing, storage, and installation of material described in Section 4.0

2.1.4 Furnishing all labor, tools, and miscellaneous materials, e.g. cable ties, markers, etc.

## 3.0 CODES AND STANDARDS

Items supplied shall conform to this Specification, other specifically referenced Project Specifications and the applicable portions of referenced Codes and Standards. The relevant revisions of all referenced Codes and Standards are listed in Specification M-500.

## 4.0 AUXILIARY MATERIALS

### 4.1 Cable Terminals and Connectors

4.1.1 Terminals for #20 AWG through #8 AWG power, control, and instrumentation cables shall be insulated radiation resistant locking spade or ring tongue, compression type. Terminals shall be made of high conductivity electrolytic copper, electro-tin plated.

4.1.2 Connectors for #6 AWG or larger cable shall be long barrel compression type with blind ends. The terminals shall be made of high conductivity electrolytic copper, electro-tin plated. Terminals shall be Burndy HYLUG®™ , Thomas and Betts Company Color-Keyed®™ or equal.

4.1.3 Terminals and connectors described in Sections 4.1.1 and 4.1.2 are not required when conductors are terminated in tubular clamp type termination blocks.

4.2 Cable splices are not acceptable.

4.3 Insulation for cable to bus bar connections shall be nuclear grade Raychem heat shrinkable tubing, or equal.

4.4 Cable ties and cable markers shall be radiation resistant, non-conducting, non-flammable, and self-extinguishing.

4.5 Cable markers shall be white opaque plastic tags marked with indelible black ink pens.

## 5.0 PROCUREMENT, RECEIVING, HANDLING AND STORAGE

5.1 All cable shall be furnished by WSRC. Connectors shall be procured by the melter Supplier. The size and type to be used is shown on detailed drawings or defined in this specification.

5.2 Refer to Specification M-SPC-S-00001, section 6.0, "Preparation for Shipment," for instructions regarding procedure submittals for receiving, handling and storage.

## 6.0 FABRICATION

6.1 Installation shall comply with requirements of 'National Electrical Code', NFPA-70-2005, Errata-04, and Tentative Interim Amendment – TIA-05.

6.2 To avoid damage to the cable's sheathing, jacketing, or insulation, the cable bending radius shall not be smaller than the manufacturer's recommended minimum bending radius.

6.3 The diameter of sheaves and wheels used for installing cable shall be at least five times the diameter of the cable.

6.4 Cables may be pulled with a pulling grip attached directly to the conductors or by a basket grip over the jacketing and/or insulation.

6.5 When pulling a three-conductor cable with a basket grip, the maximum allowable pulling tension is 1,500 pounds.

6.6 When pulling a 3-1/c (three single conductor) cable with a basket grip on each cable, the maximum allowable pulling tension is 2,000 pounds.

6.7 Conduits shall be cleaned and checked for obstructions by pulling a swab or mandrel through each conduit immediately prior to pulling cable.

6.8 Installation and handling of any specialty cable shall follow the manufacturer's instructions.

6.9 Not used.

6.10 Cables shall be formed to avoid sharp bends when entering or leaving boxes and to

avoid bearing against the edges of these enclosures.

## 7.0 CABLE TERMINATION

7.1 After installation and insulation testing, the Supplier shall terminate power, control, and instrumentation and thermocouple extension cable in accordance with the connection diagrams.

7.2 The cable jacket of multi-conductor cables shall be maintained intact as close as possible to the conductor termination and be stripped only to the extent necessary to spread the insulated conductors to make the terminations.

7.3 Not used.

7.4 Terminal sizes shall match terminal screws and conductor sizes. Torque values shall be per manufacturer's recommendations.

7.5 Ratchet-type crimping tools shall be used where applicable. Crimping tools shall be designed to repeat the same compression every operation and prevent release until full crimping action is complete.

7.6 Crimping tools shall be coded to indicate the corresponding terminal type and size.

7.7 The terminals and crimping dies shall be color-coded to assure that the proper crimping die is used.

7.8 Instrument cables with metallic-tape shielding or with metallic braid shielding shall be prepared for the new equipment termination as shown in the wiring diagrams.

7.9 When preparing soldered terminations at Lower Holders (nozzles) refer to the Electrical Lower Holder Assembly drawings and the wiring diagrams.

7.10 Instrument cable shields shall be continuous to the ground point and shall be grounded as indicated on the wiring diagrams.

7.11 All un-insulated connectors shall be insulated. For cable to bus bar terminations, the requirements shall be as defined in section 4.3. For all other applications, insulating tape or heat shrink tubing shall be utilized and shall be suitable for the environment as defined in Specification M-500.

## 8.0 INSPECTION AND TESTING

8.1 The Supplier shall provide inspection and field testing of his work activities, to assure compliance with the requirements of the Specification.

8.2 The Supplier shall perform the following cable inspections and provide a Cable Inspection Report in accordance with Attachment 10.1 to verify:

8.2.1 Routing of cables in accordance with the wiring diagrams and Cable Routing Table DS-E-1924.

8.2.2 Proper support and training of cables inside equipment, conduits and pull boxes.

8.2.3 Correct connector installation on cable conductors.

8.2.4 Terminations of cables in accordance with the connection diagrams.

8.2.5 Proper installation of cable identification markers with correct identification.

8.3 The Supplier shall perform the following tests in accordance with NEMA WC 53 and the manufacturer's instructions. Provide an electrical test report in accordance with Attachment 10.1.

8.3.1 One Minute Insulation Resistance Tests prior to the connection of the cable to equipment.

8.3.2 Low voltage (600 V) power conductors shall be tested at 500Vdc (minimum) and shall have a minimum insulating resistance of 5 megohms from conductor-to-ground. An initial resistance reading of 200 + megohms or "infinity" shall satisfy the insulation resistance requirements and the test need not be continued.

8.3.3 For 600 V control cables - #14 AWG or smaller, and instrument and thermocouple extension cables, insulation resistance tests are not required.

8.3.4 All cable shall be tested for continuity before connecting the cable to equipment and to the Lower Holders.

## 9.0 QUALITY DOCUMENTATION

The Subcontractor shall submit verification reports as listed on Quality Verification Documentation Requirements (QVDR) stating that each cable has been tested and inspected in accordance with Section 8.0.

## 10.0 ATTACHMENTS

10.1 Quality Verification Document Requirements with Instructions (2 pages)

Attachment No. 10.1
Revision No. 6
Spec/Req'n No. E-501
Page 1 of 2

# Quality Verification Document Requirements

| 1. Document Category Number | 2. Specification Paragraph Reference | 3. Document Description | 4. SSR Release | 5. WSRC Receipt Inspection Check-In | 6. Remarks | 7. DOC Supplier Page Count |
|---|---|---|---|---|---|---|
| 25.0 | 8.2 | Cable Inspection Report | | | | |
| 25.0 | 8.3 | Electrical Test Reports | | | | |
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| 8. Supplier's Order No. | 9. Supplier's Part | 10. Supplier's Part Name | 11. Quantity |
|---|---|---|---|
| 12. PO No. | 13. WSRC Line/Equip Tag or Code No. | 14. WSRC Part Name | |

15. Supplier's Conformance Statement

We certify that the work and required documents meet the requirements of the procuring documents.

Authorized Supplier Signature _____ Title _____ Date _____

16. Source Surveillance Representative at Suppliers Facility

Work was released based on satisfactory completion of quality surveillance and review of documentation.

☐ With Authorized Deviations Noted in Column 6
☐ No Deviations

Signature of SSR _____ Date _____

17. Receiving Inspection at SRS

This form and the quality verification documents referenced hereon have been received and their relationship to the hardware items verified.

Signature of WSRC Inspector _____ Date _____

# Quality Verification Document Requirements Form Instructions

**Purpose** The Quality Verification document Requirements (QVDR) is initiated by SRS and completed by the Supplier when providing quality verification documents. The QVDR is a multipurpose form to

Transmit quality verification documents from the Supplier,
Provide evidence of SSR release of documentation and/or work, and
Provide evidence of an SRS inspection check of documentation received at SRS.

**WSRC Entries**

| Entry No. | Information Required |
|---|---|
| 1 | Enter Document Category Number — see below. |
| 2 | Enter Specification Number and Paragraph Reference. |
| 3 | Enter Description corresponding to the Document Category Number. |
| 4 | SSR to initial upon item release. |
| 6 | Enter "Remarks: as appropriate. |
| 16 | SSR and dates release. |

**Field Entries**

| Entry No. | Information Required |
|---|---|
| 5 | SRS inspector at the jobsite to complete check-in. |
| 17 | The SRS Inspector will review the quality verification documentation package. If found satisfactory, he signs and dates the check-in statement. |

**Supplier Entries**

| Entry No. | Information Required |
|---|---|
| 7 | Enter number of pages of quality verification document being submitted. |
| 8 | Enter information required. |
| 9 | Enter information required. |
| 10 | Enter information required. |
| 11 | Enter the quantity of units covered by the documents submitted. For each item on Entry No. 12 being released, provide a separate copy of this completed form and the supporting quality verification documents. |
| 12 | Enter information required. |
| 13 | Enter information required. |
| 14 | Enter information required. |
| 15 | Supplier — Signature of an employee authorized to sign such documents. |

**Document Category Numbers and Descriptions**

12.0 Welding Verification Reports — Reports of welding performed to include weld identification, and certification that qualified welding procedures and welders were used.

13.0 Material Verification Reports — Reports relative to material which confirm, substantiate or assure that an activity or condition has been implemented in conformance with code and material specifications imposed by the procurement documents.

14.0 Major Repair Verification Reports — Reports may include weld repair locations (maps), material test reports for filler metal, pre- and post-weld heat treatment records, NDE records, etc. The resolution of whether a repair is major or not is an SRS responsibility.

15.0 Cleaning and Coating Verification Reports — Reports include a certification of visual examination for surface preparation, surface profile, materials, etc.; and also humidity data, temperature data and coating thickness data as required by the procurement documents.

16.0 Heat Treat Reports — Reports normally include furnace charts and similar records which identify and certify the item(s) treated, the procedure used, furnace atmosphere, time at temperature, cooling rate, etc.

17.0 Material Property Reports

- 17.1 MTR (Material Test Reports) — These reports include all chemical, physical, mechanical, and electrical property test data required by the material specification and applicable codes. These are applicable to cement, concrete, metals, cable jacket materials, rebar, rebar splices, etc.
- 17.2 Impact Test Data — Reports of Charpy or drop weight tests including specimen configuration, test temperature and fracture data.
- 17.3 Ferrite Data — Reports of the ferrite percentage for stainless steel materials used, including castings and welding filler metals as deposited.
- 17.4 Material Certificate of Conformance — Documents which certify conformance to the requirements of the applicable material specification.
- 17.5 Electrical Property Reports — Reports of electrical characteristics, e.g., dielectric, impedance, resistance, flame tests, corona, etc.

18.0 Code Compliance — Verifying documents (such as data Forms U-1, M-2, State, etc.), which are prepared by the manufacturer or installer and certified by the Authorized Code Inspector.

19.0 UT — Ultrasonic Examination and Verification Reports — Examination results of certain characteristics of discontinuities and inclusions in material by the use of high frequency acoustic energy.

20.0 RT — Radiographic Examination and Verification Reports — Examination results of certain characteristics of discontinuities and inclusions in materials by x-ray or gamma-ray exposure of photographic film, including film itself.

21.0 MT — Magnetic Particle Examination and Verification Reports — Examination results of surface (or near surface) discontinuities in magnetic materials by distortion of an applied magnetic field.

22.0 PT — Liquid Penetrant Examination and Verification Reports — Examination results of surface discontinuities in materials by application of a penetrating liquid in conjunction with suitable developing techniques.

23.0 Eddy Current Examination and Verification Reports — Examination results of discontinuities in material by distortion of an applied electromagnetic field.

24.0 Pressure Test — Hydro, Air, Leak, Bubble or Vacuum Test and Verification Reports — Results of hydrostatic or pneumatic structural integrity and leakage tests.

25.0 Inspection and Verification Reports — Documented findings resulting from an inspection.

26.0 Performance Test and Verification Reports — Reports of Test Results

- 26.1 Mechanical Test, e.g., pump, performance data, valve stroking, load, temperature rise, calibration, environment, etc.
- 26.2 Electrical Tests, e.g., load, impulse, overload, continuity, voltage, temperature rise, calibration, saturation, loss, etc.

27.0 Prototype Test Report — Report of the test which is performed on a standard or typical example of equipment, material or item, and which is not required for each item produced in order to substantiate the acceptability of equal items. This normally includes tests which may, or could be expected to, result in damage to the item(s) tested.

28.0 Certificate of Conformance—A document signed or otherwise authenticated by an authorized individual certifying the degree to which items or services meet specified requirements.